FIG. 1

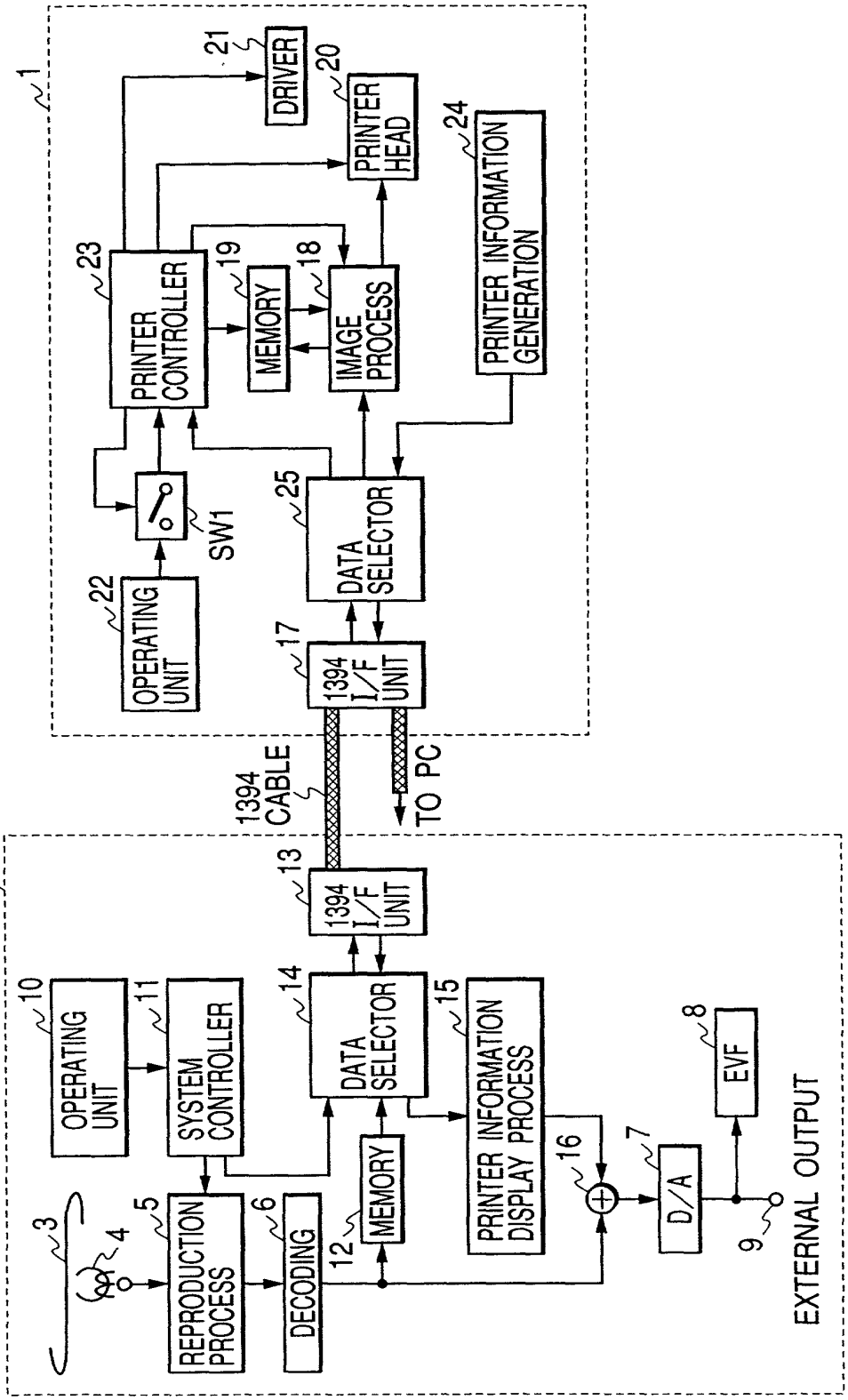
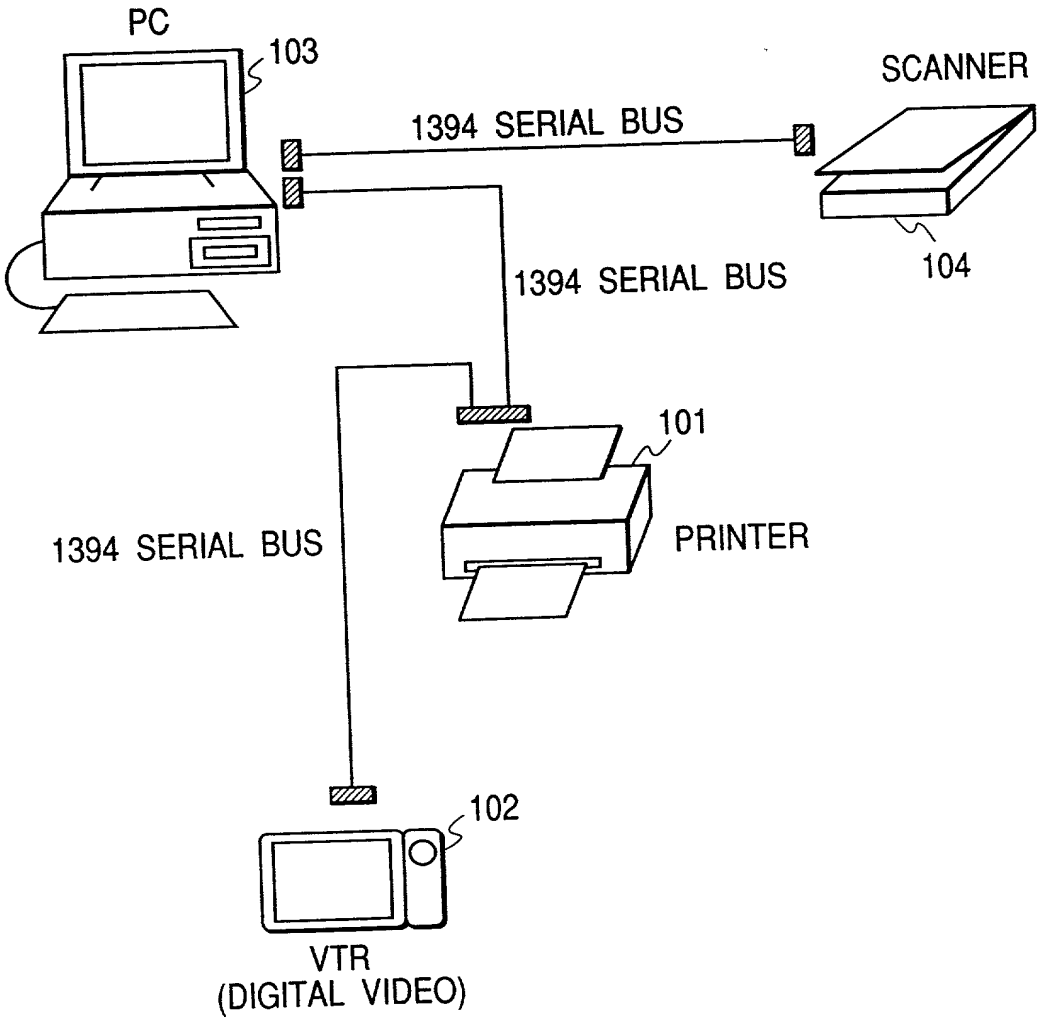

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
DRIVER
PRINTER HEAD
PRINTER CONTROLLER
MEMORY
IMAGE PROCESS
PRINTER INFORMATION GENERATION
SW1
DATA SELECTOR
OPERATING UNIT
1394 I/F UNIT
1394 CABLE
TO PC
OPERATING UNIT
SYSTEM CONTROLLER
REPRODUCTION PROCESS
DECODING
MEMORY
DATA SELECTOR
PRINTER INFORMATION DISPLAY PROCESS
D/A
EVF
EXTERNAL OUTPUT

FIG. 2



EP 0 975 126 A2

FIG. 3

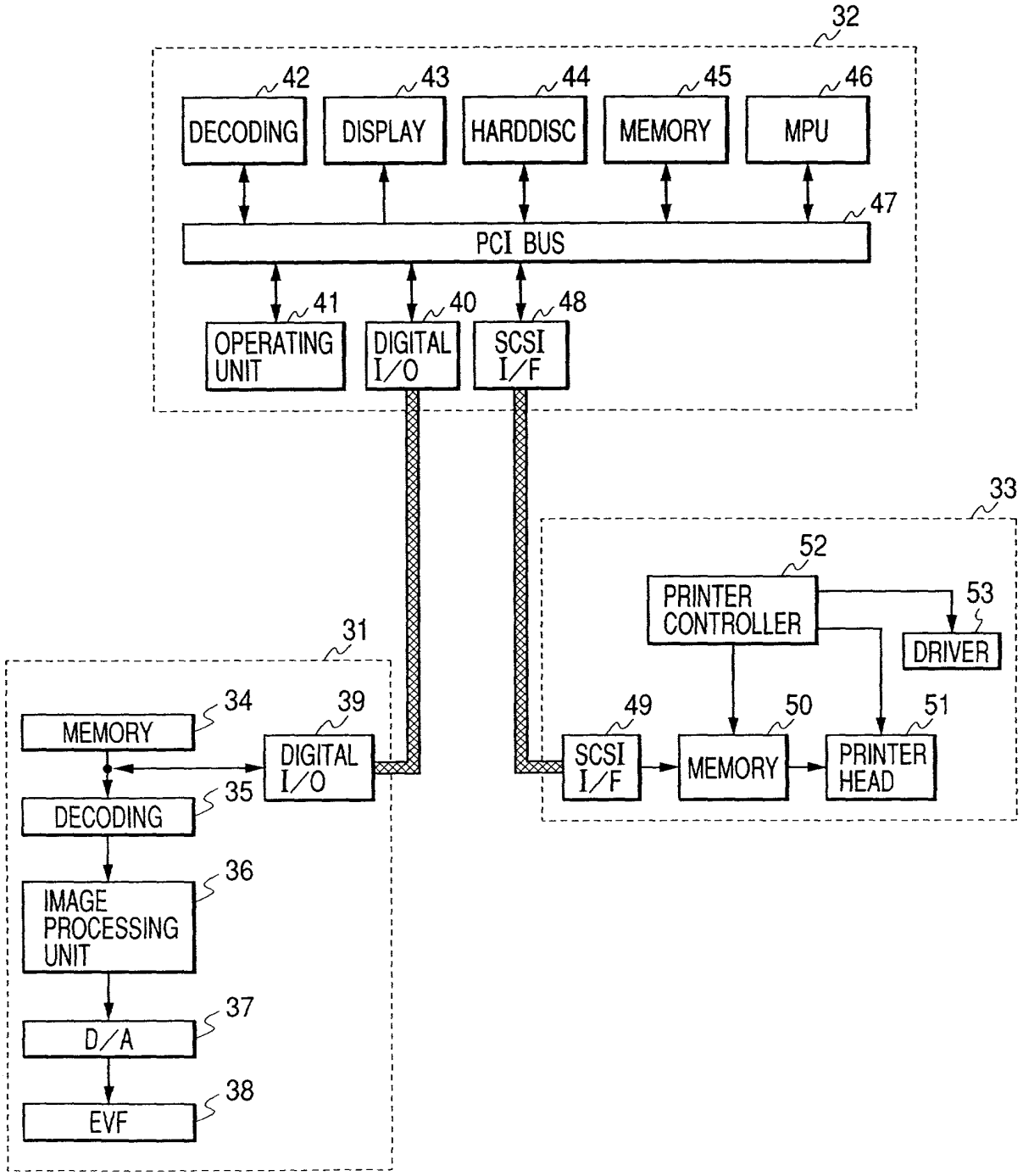

32
42
DECODING
43
DISPLAY
44
HARDDISC
45
MEMORY
46
MPU
47
PCI BUS
41
OPERATING UNIT
40
DIGITAL I/O
48
SCSI I/F
33
52
PRINTER CONTROLLER
53
DRIVER
49
SCSI I/F
50
MEMORY
51
PRINTER HEAD
31
34
MEMORY
39
DIGITAL I/O
35
DECODING
36
IMAGE PROCESSING UNIT
37
D/A
38
EVF

FIG. 4

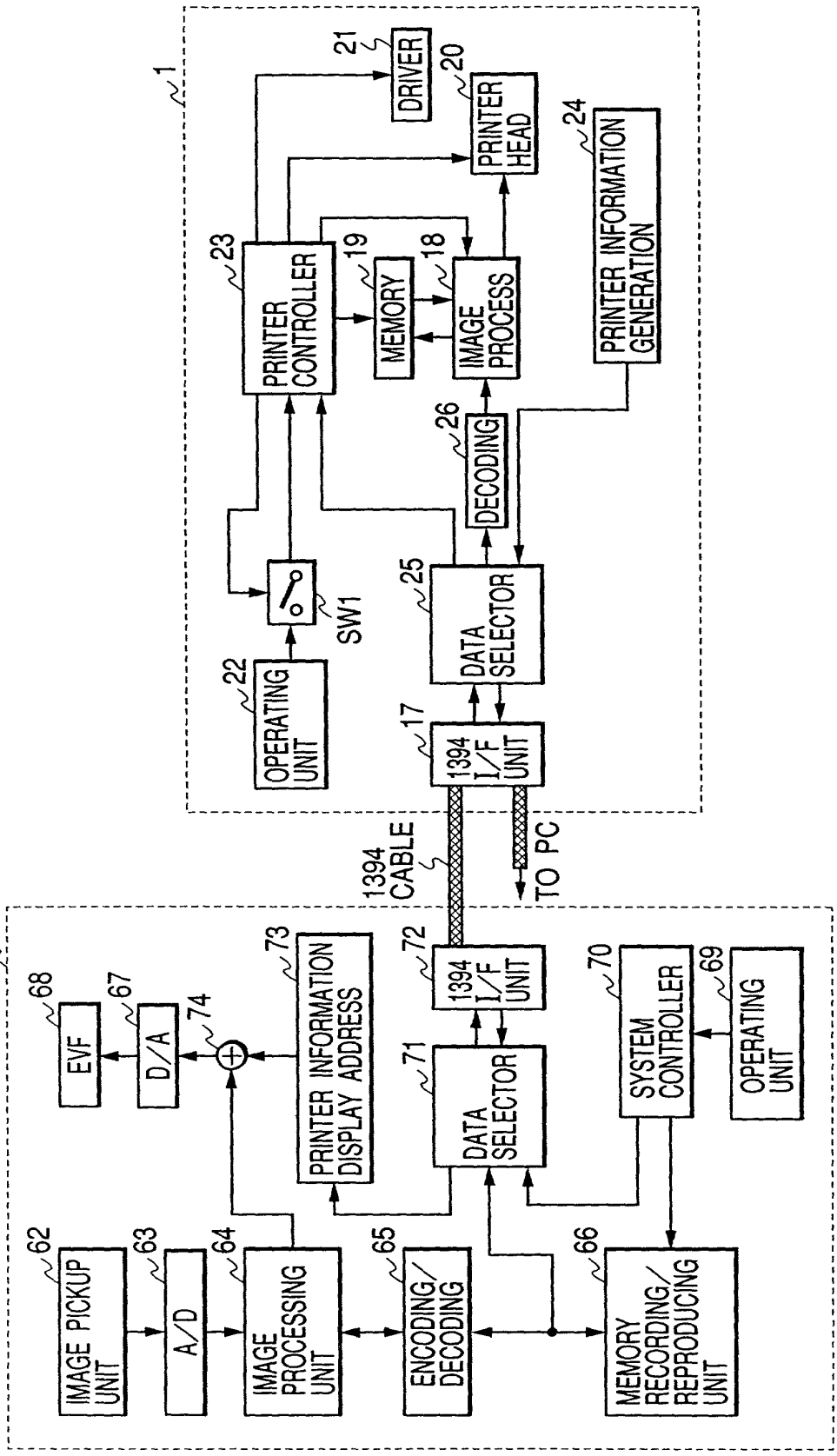

1
21
DRIVER
20
PRINTER HEAD
24
PRINTER INFORMATION GENERATION
23
PRINTER CONTROLLER
19
MEMORY
18
IMAGE PROCESS
26
DECODING
25
DATA SELECTOR
SW1
22
OPERATING UNIT
17
1394 I/F UNIT
1394 CABLE
TO PC
61
68
EVF
67
D/A
74
73
PRINTER INFORMATION DISPLAY ADDRESS
72
1394 I/F UNIT
71
DATA SELECTOR
70
SYSTEM CONTROLLER
69
OPERATING UNIT
62
IMAGE PICKUP UNIT
63
A/D
64
IMAGE PROCESSING UNIT
65
ENCODING/ DECODING
66
MEMORY RECORDING/ REPRODUCING UNIT

FIG. 5

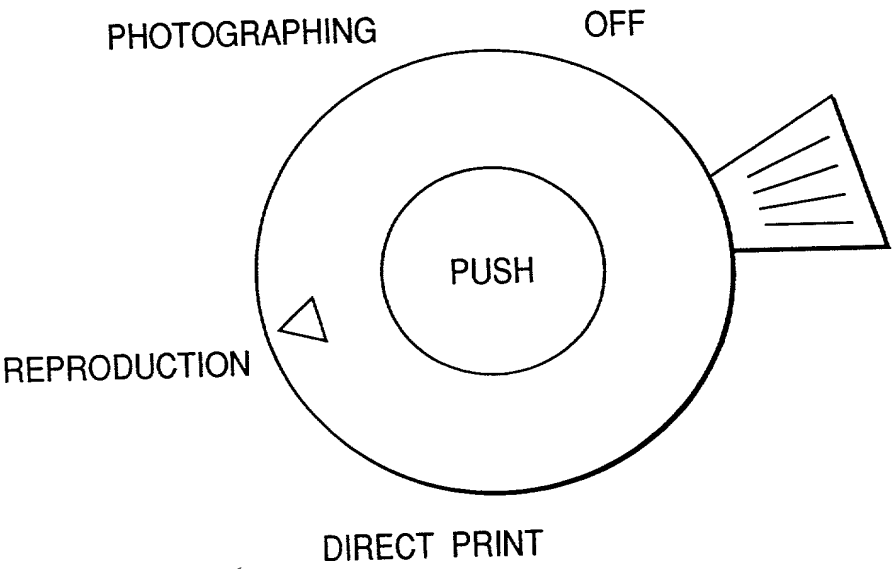


FIG. 6

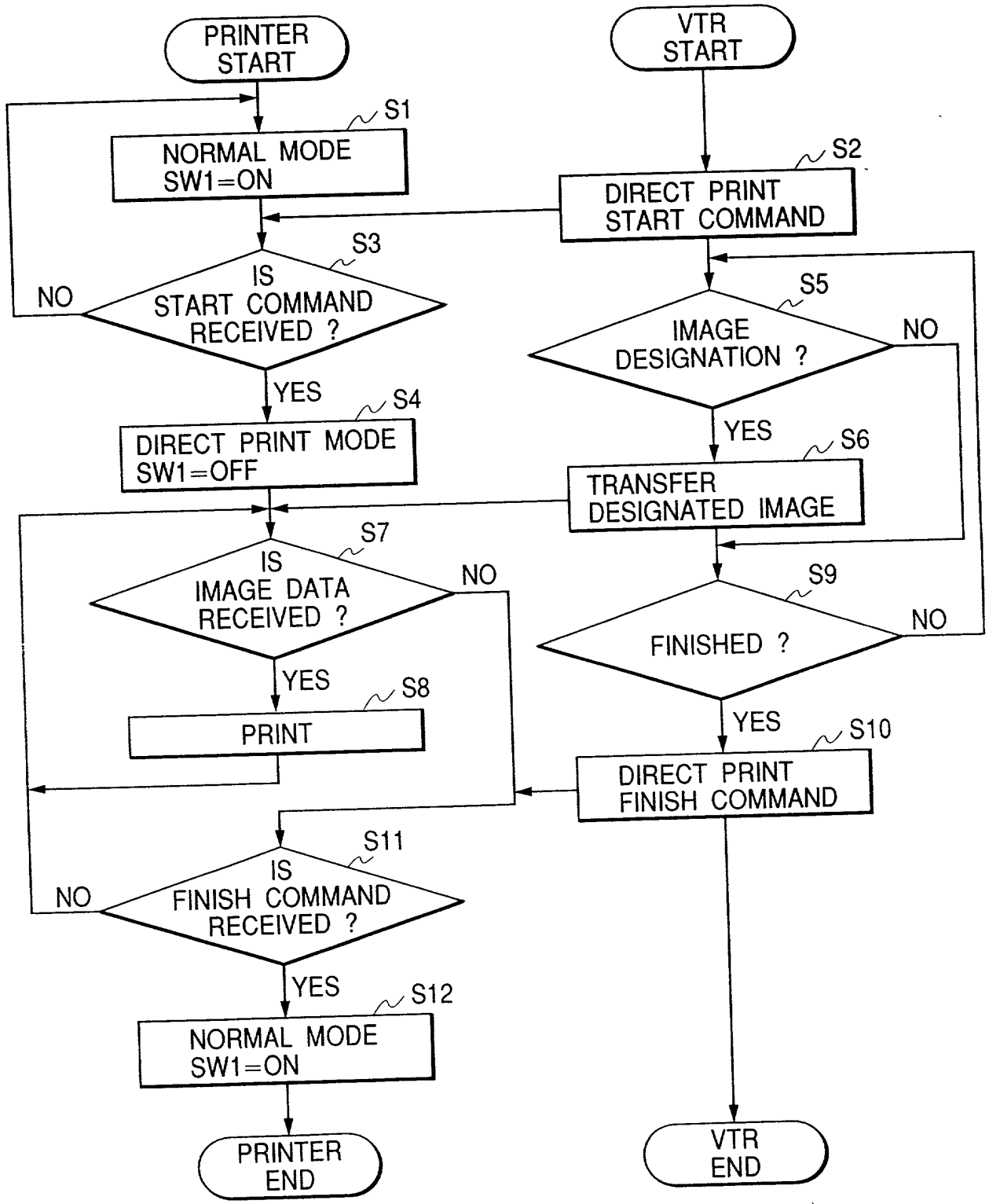

PRINTER START
VTR START
S1
NORMAL MODE SW1=ON
S2
DIRECT PRINT START COMMAND
S3
IS START COMMAND RECEIVED ?
NO
YES
S4
DIRECT PRINT MODE SW1=OFF
S5
IMAGE DESIGNATION ?
NO
YES
S6
TRANSFER DESIGNATED IMAGE
S7
IS IMAGE DATA RECEIVED ?
NO
YES
S8
PRINT
S9
FINISHED ?
NO
YES
S10
DIRECT PRINT FINISH COMMAND
S11
IS FINISH COMMAND RECEIVED ?
NO
YES
S12
NORMAL MODE SW1=ON
PRINTER END
VTR END

FIG. 7

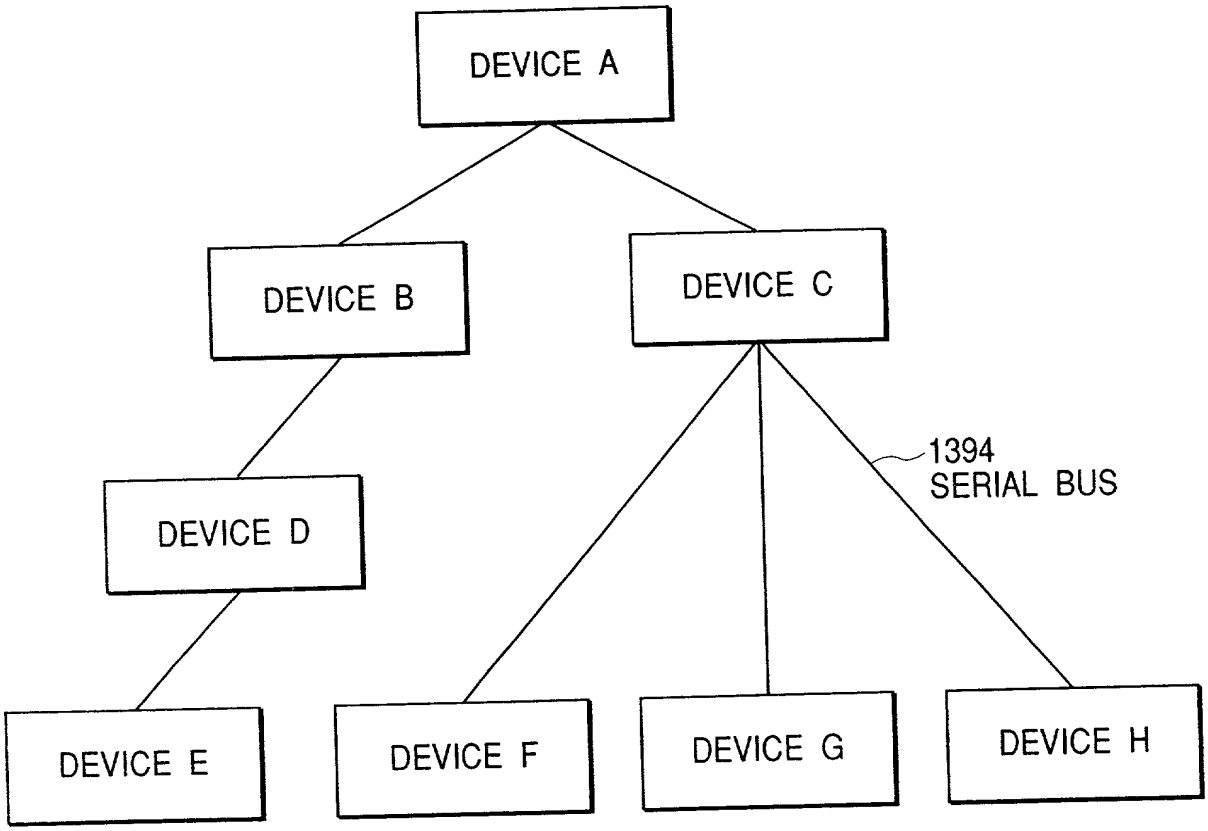

DEVICE A
DEVICE B
DEVICE C
DEVICE D
DEVICE E
DEVICE F
DEVICE G
DEVICE H
1394
SERIAL BUS

FIG. 8

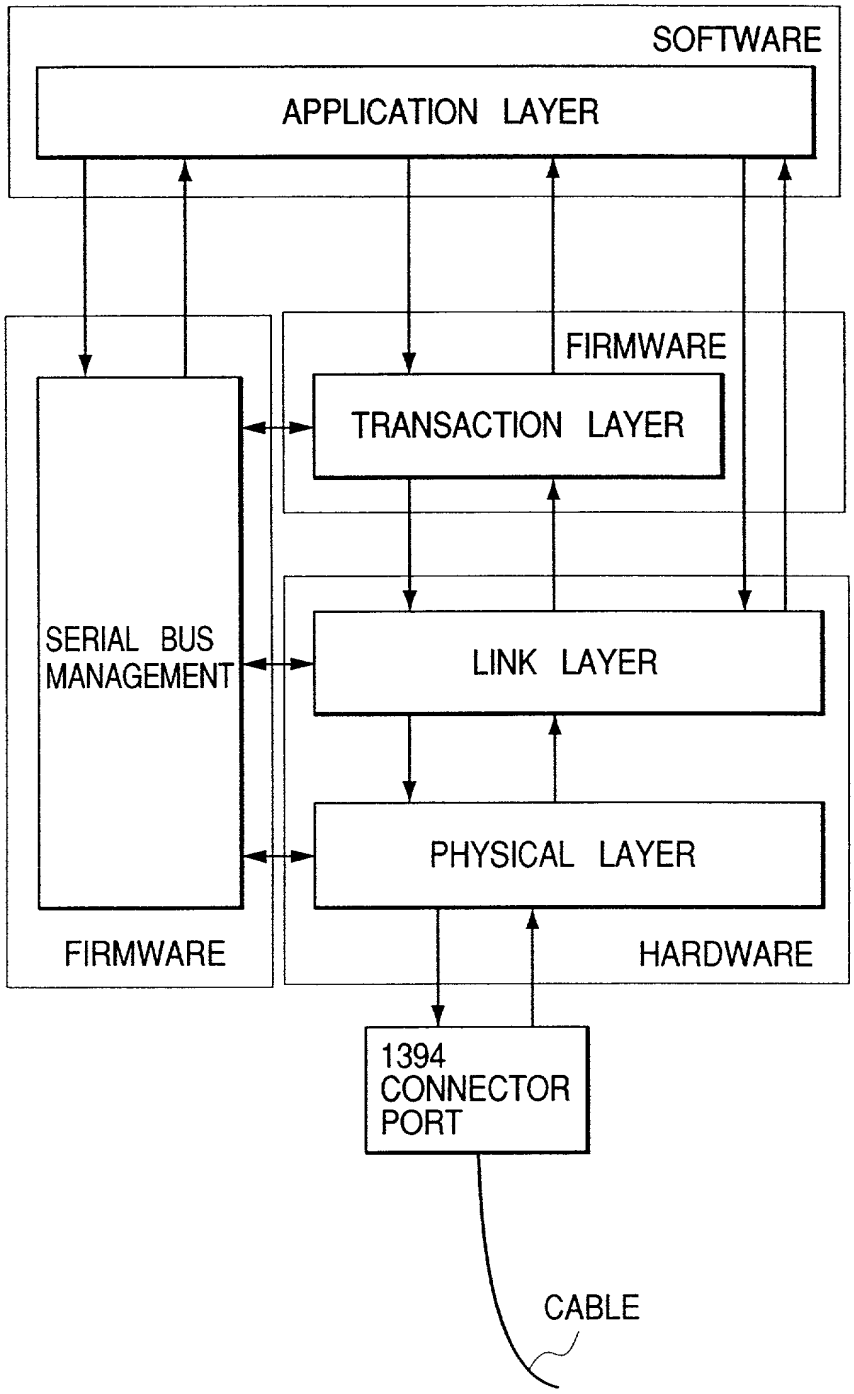

SOFTWARE
APPLICATION LAYER
FIRMWARE
TRANSACTION LAYER
SERIAL BUS MANAGEMENT
LINK LAYER
PHYSICAL LAYER
FIRMWARE
HARDWARE
1394 CONNECTOR PORT
CABLE

FIG. 9

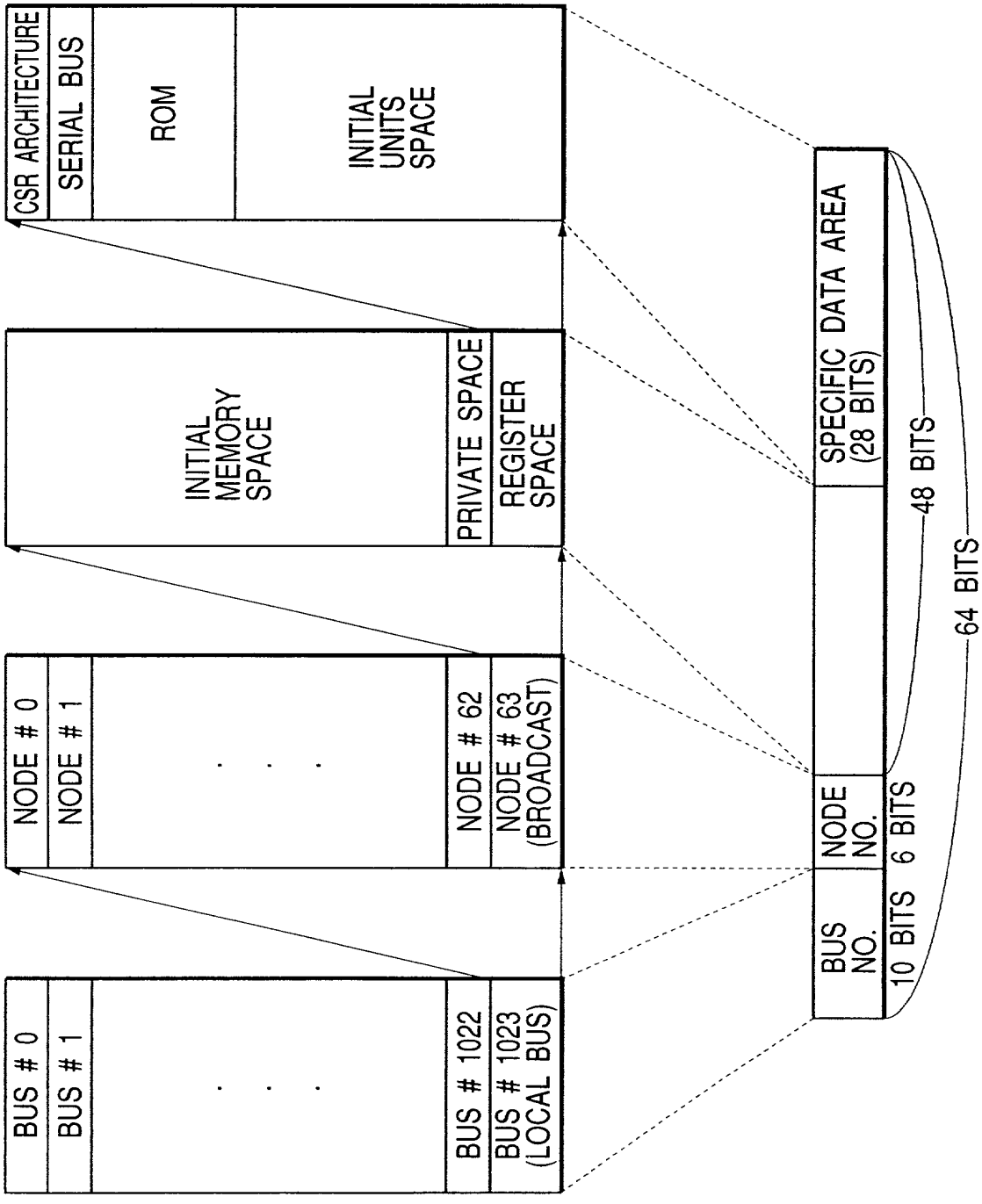

BUS # 0
BUS # 1
BUS # 1022
BUS # 1023 (LOCAL BUS)
NODE # 0
NODE # 1
NODE # 62
NODE # 63 (BROADCAST)
INITIAL MEMORY SPACE
PRIVATE SPACE
REGISTER SPACE
CSR ARCHITECTURE
SERIAL BUS
ROM
INITIAL UNITS SPACE
BUS NO.
NODE NO.
SPECIFIC DATA AREA (28 BITS)
10 BITS
6 BITS
48 BITS
64 BITS

FIG. 10

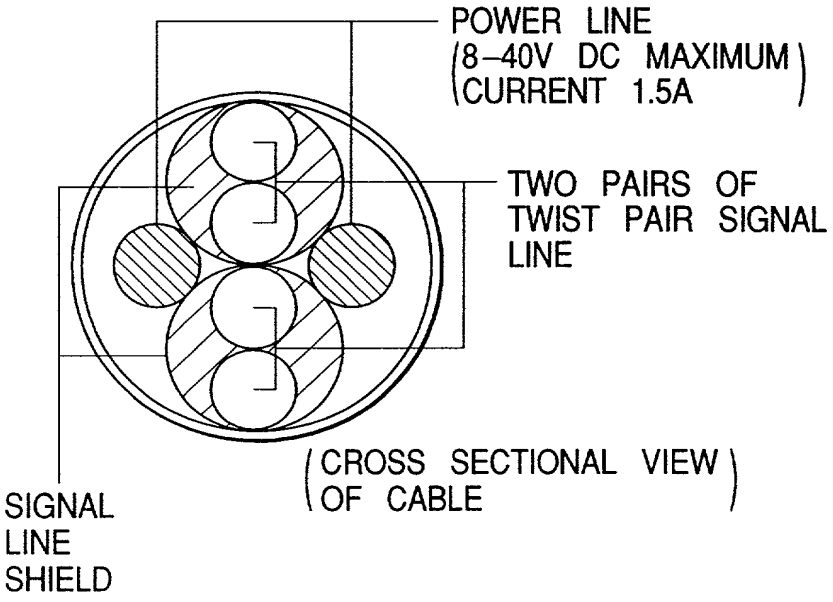

POWER LINE
(8–40V DC MAXIMUM
CURRENT 1.5A)
TWO PAIRS OF
TWIST PAIR SIGNAL
LINE
(CROSS SECTIONAL VIEW
OF CABLE)
SIGNAL
LINE
SHIELD

FIG. 11

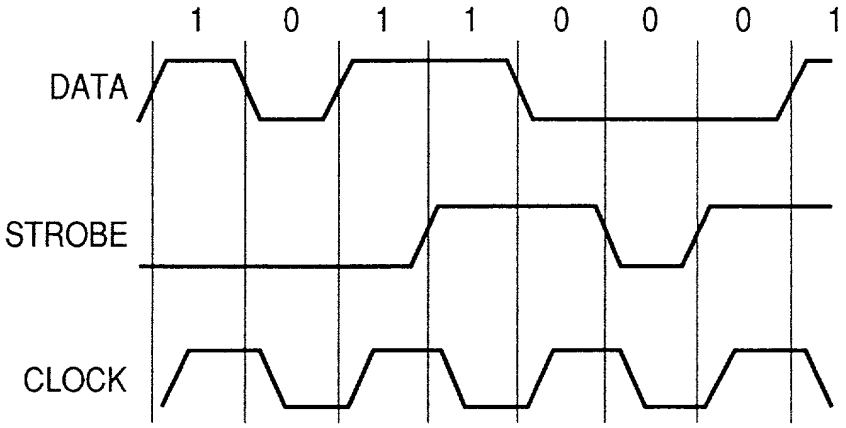
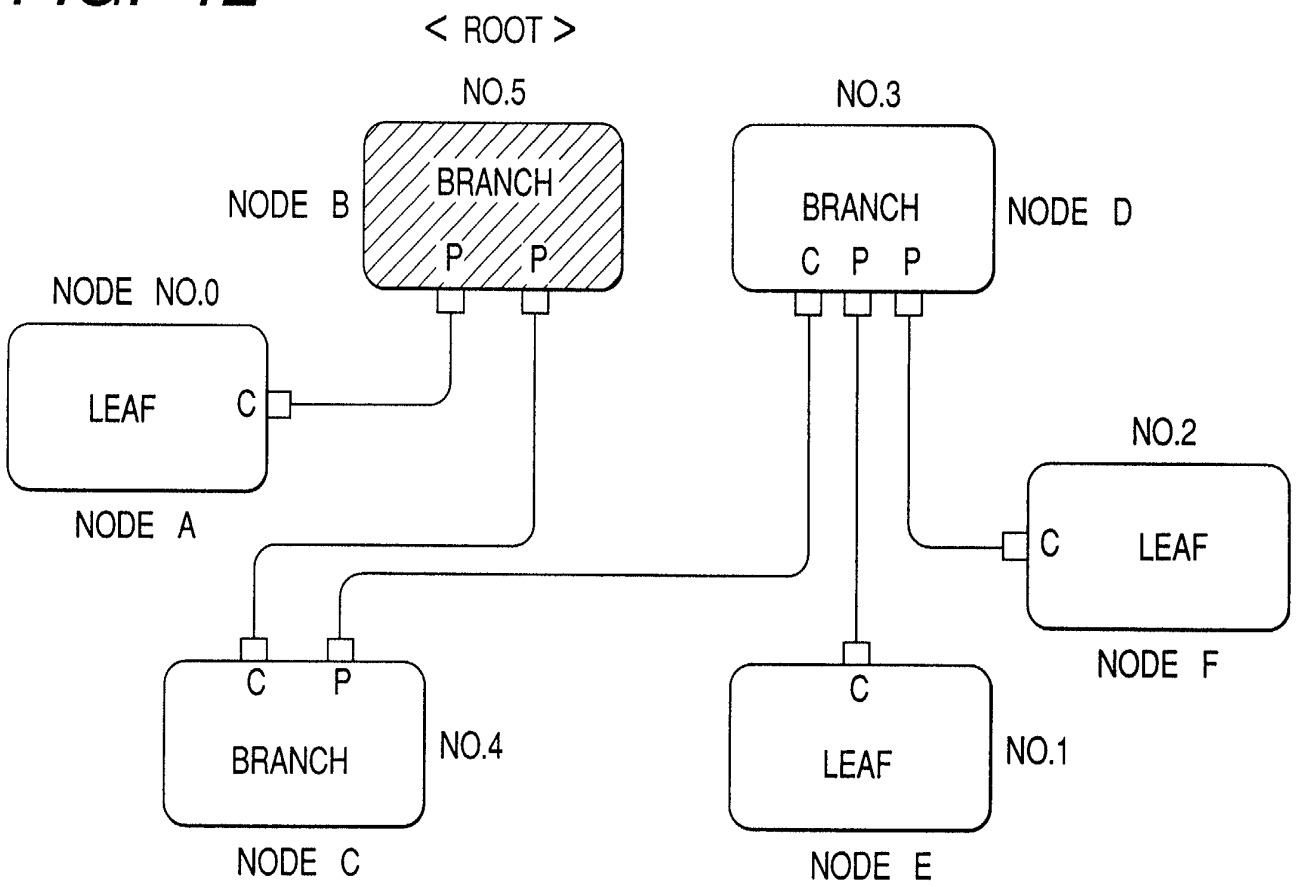

1 0 1 1 0 0 0 1
DATA
STROBE
CLOCK

FIG. 12



□ : PORT

C : PORT CORRESPONDING TO CHILD NODE

P : PORT CORRESPONDING TO PARENT NODE

BRANCH : NODE CONNECTED TO AT LEAST TWO NODES

LEAF : NODE CONNECTED TO ONLY ONE PORT

FIG. 13A

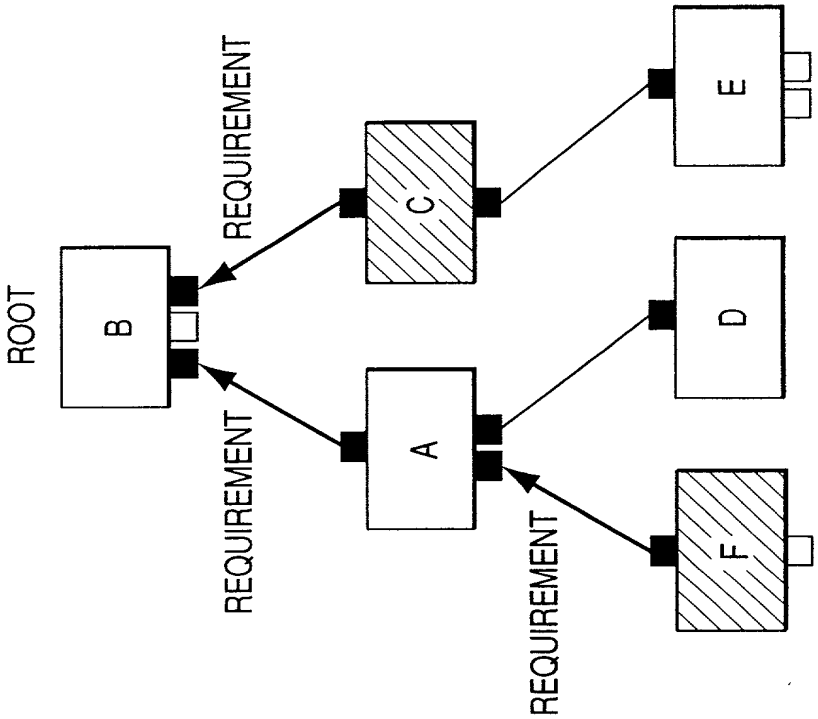
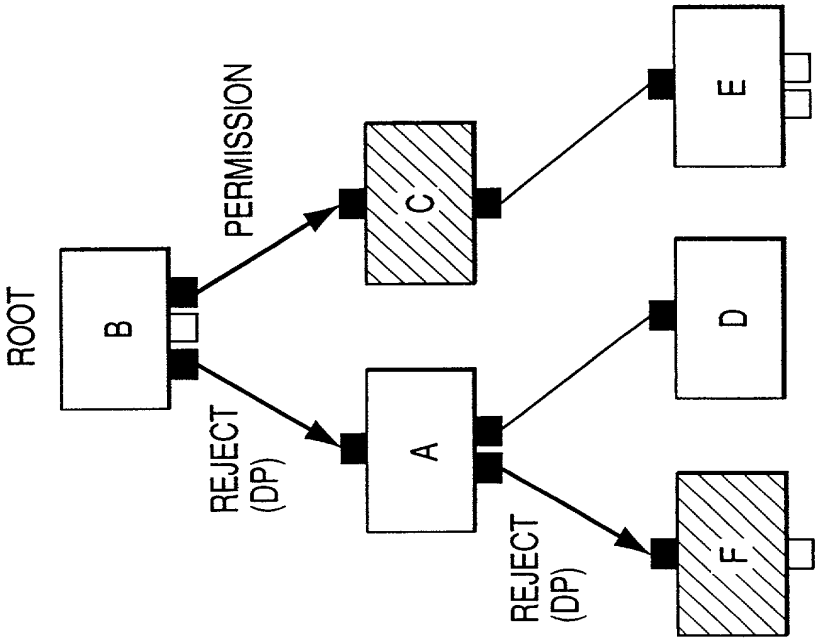


FIG. 13B



"0657/0" 96/8/9550

FIG. 14

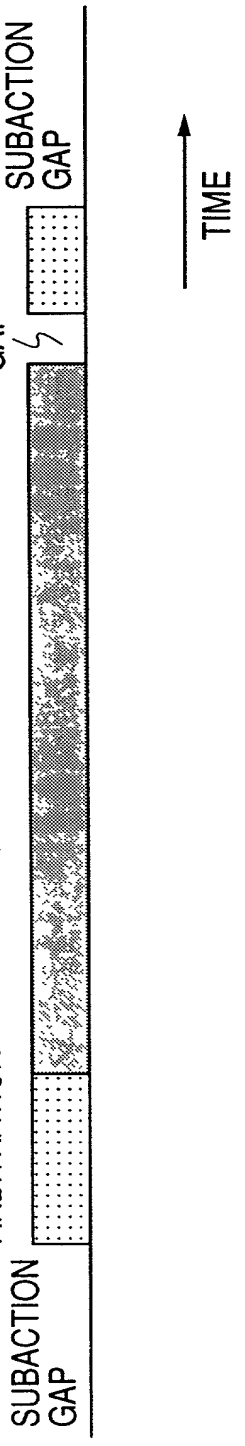


FIG. 15

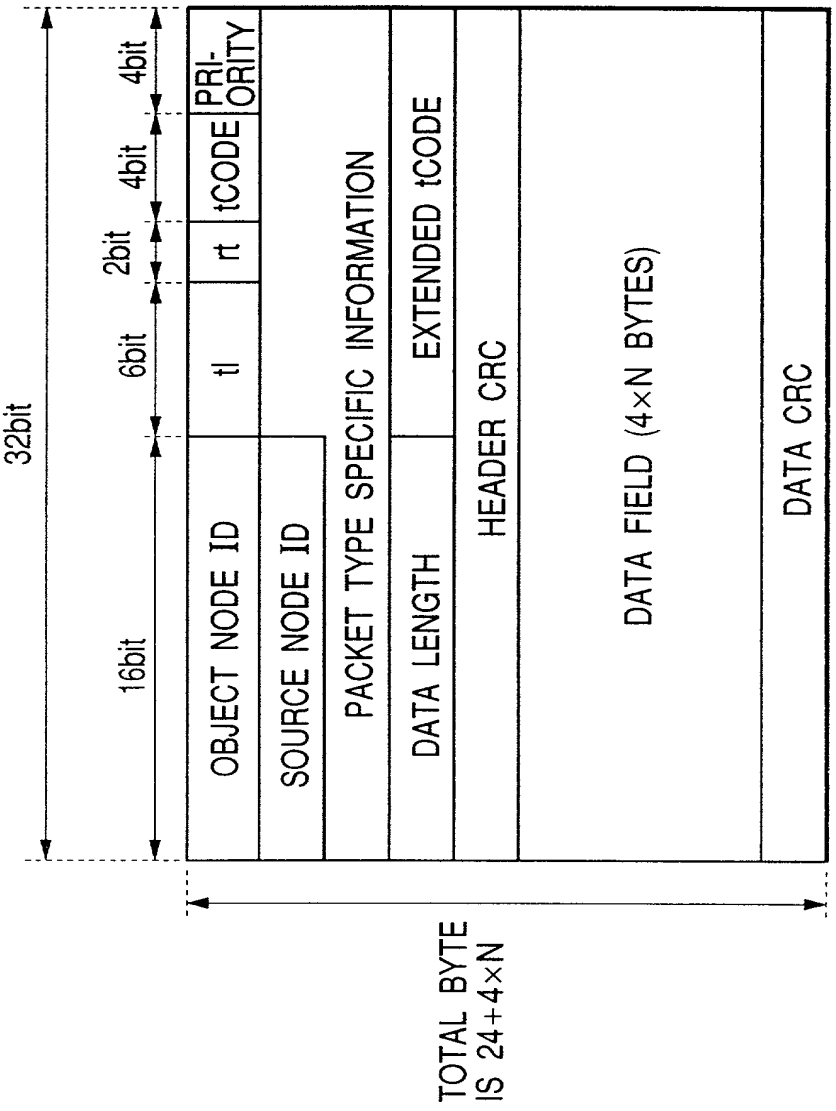

32bit
16bit
6bit
2bit
4bit
4bit
OBJECT NODE ID
tl
rt
tCODE
PRI-ORITY
SOURCE NODE ID
PACKET TYPE SPECIFIC INFORMATION
DATA LENGTH
EXTENDED tCODE
HEADER CRC
DATA FIELD (4×N BYTES)
DATA CRC
TOTAL BYTE IS 24+4×N

FIG. 16

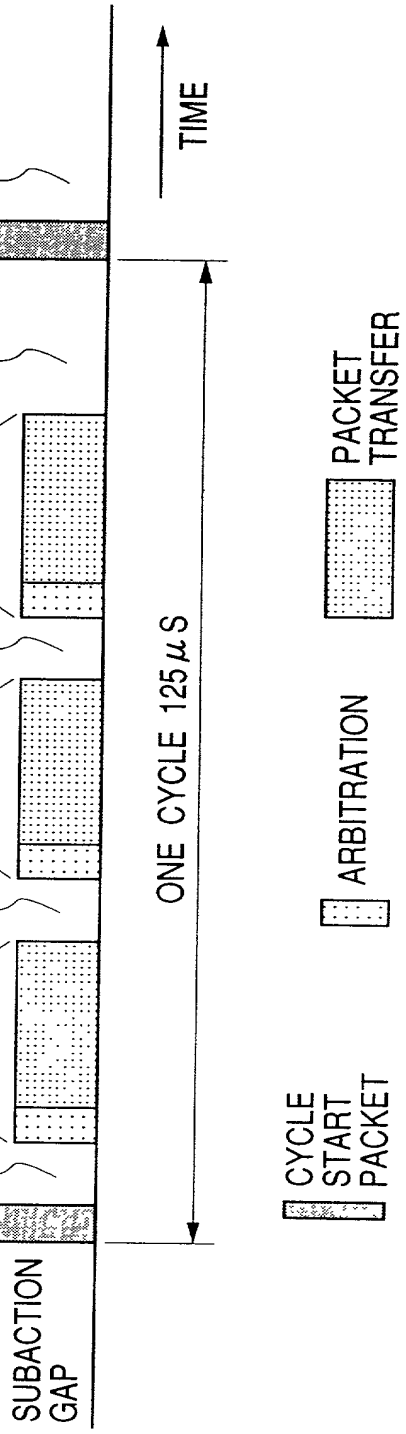

SUBACTION GAP
iso GAP
CHANNEL A
iso GAP
CHANNEL B
iso GAP
CHANNEL C
SUBACTION GAP
iso GAP
ONE CYCLE 125 μS
TIME
CYCLE START PACKET
ARBITRATION
PACKET TRANSFER
iso GAP : ISOCHRONOUS GAP

FIG. 17

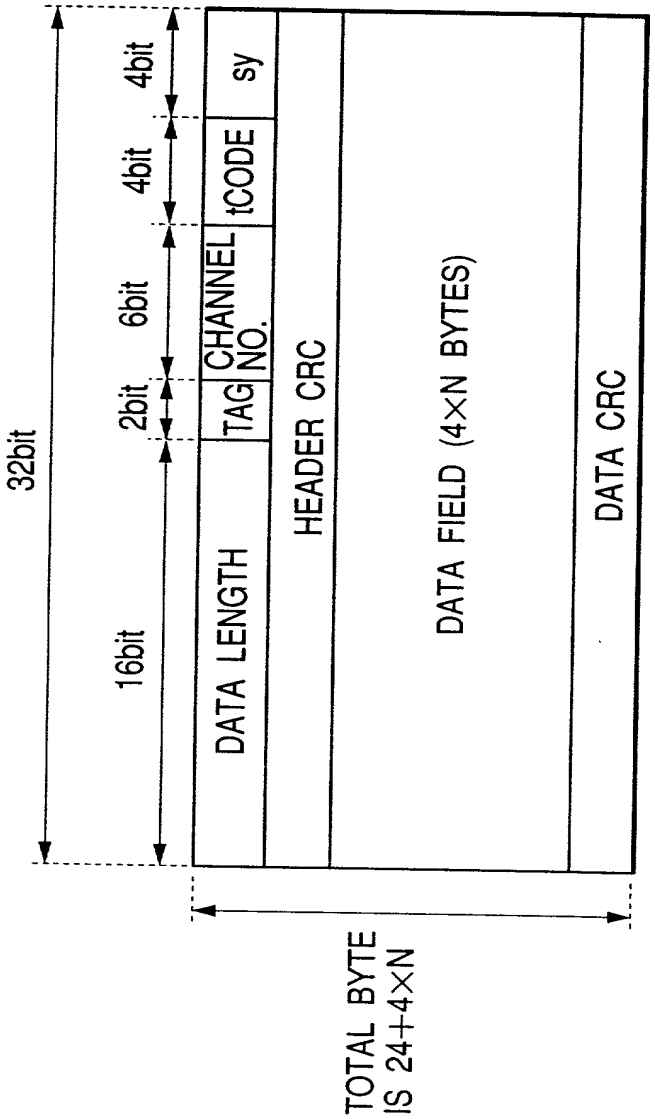

32bit
16bit
2bit
6bit
4bit
4bit
DATA LENGTH
TAG
CHANNEL NO.
tCODE
sy
HEADER CRC
DATA FIELD (4×N BYTES)
DATA CRC
TOTAL BYTE IS 24+4×N

FIG. 18

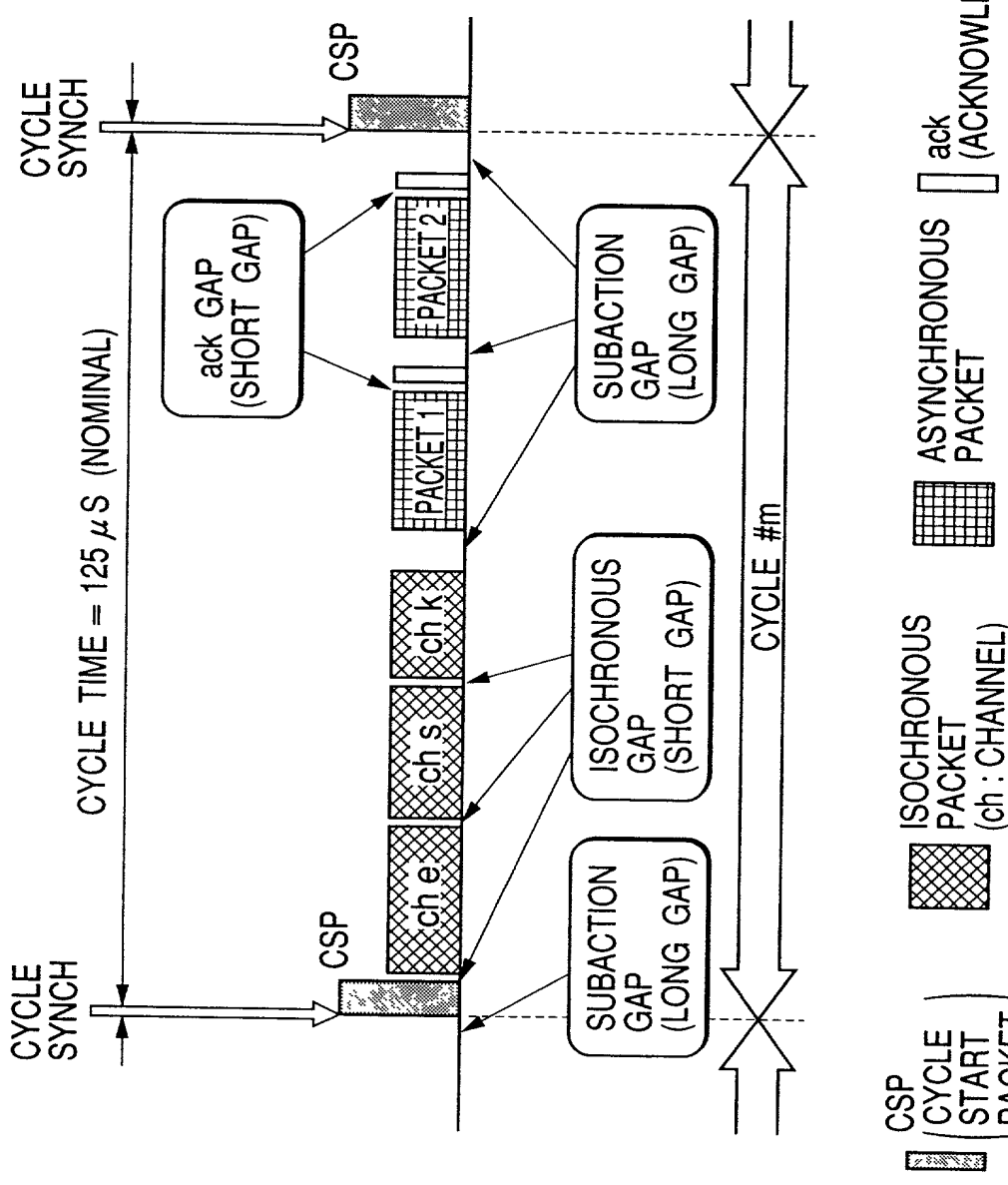

CYCLE SYNCH
CYCLE TIME = 125 μS (NOMINAL)
CSP
ack GAP (SHORT GAP)
PACKET 1
PACKET 2
ch e
ch s
ch k
SUBACTION GAP (LONG GAP)
ISOCHRONOUS GAP (SHORT GAP)
SUBACTION GAP (LONG GAP)
CYCLE #m
CSP (CYCLE START PACKET)
ISOCHRONOUS PACKET (ch : CHANNEL)
ASYNCHRONOUS PACKET
ack (ACKNOWLEDGMENT)

FIG. 19

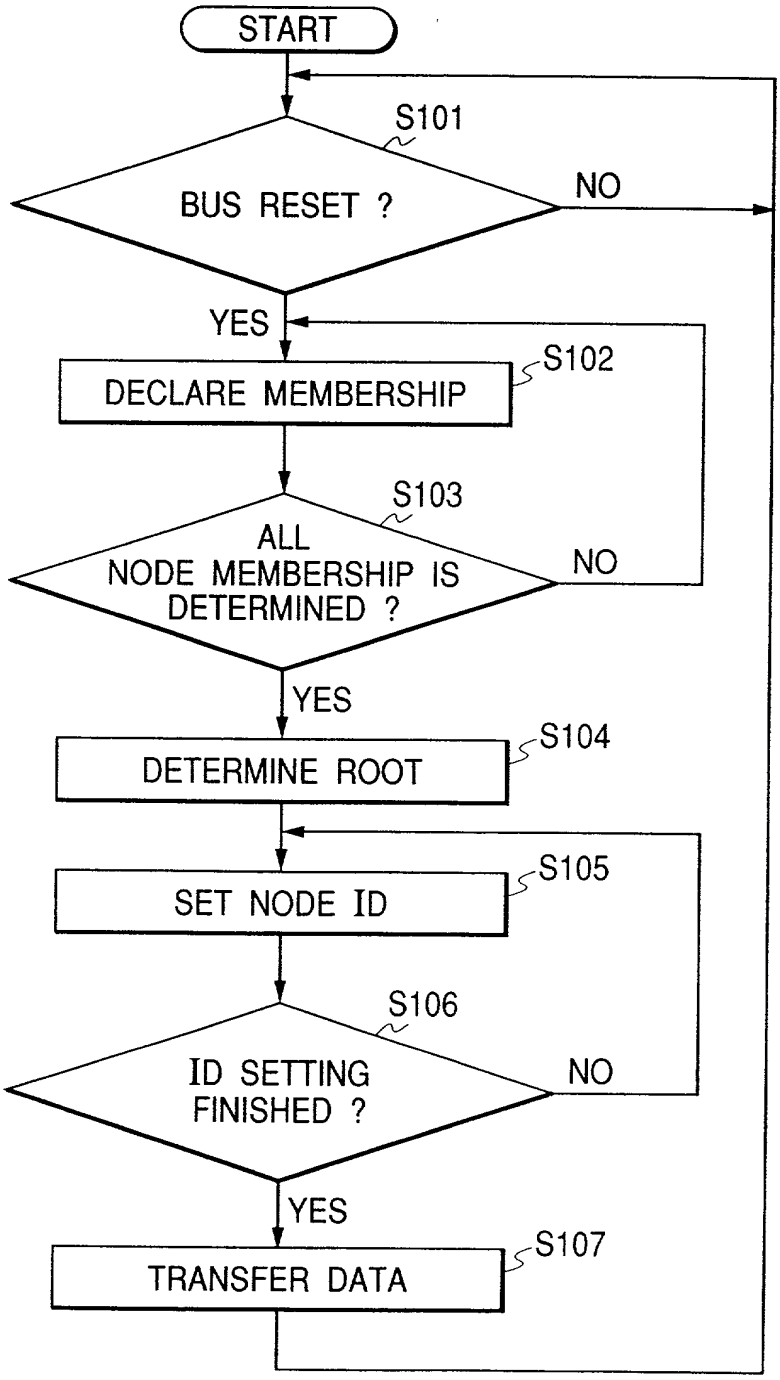

START
S101
BUS RESET ?
NO
YES
S102
DECLARE MEMBERSHIP
S103
ALL
NODE MEMBERSHIP IS
DETERMINED ?
NO
YES
S104
DETERMINE ROOT
S105
SET NODE ID
S106
ID SETTING
FINISHED ?
NO
YES
S107
TRANSFER DATA

FIG. 20

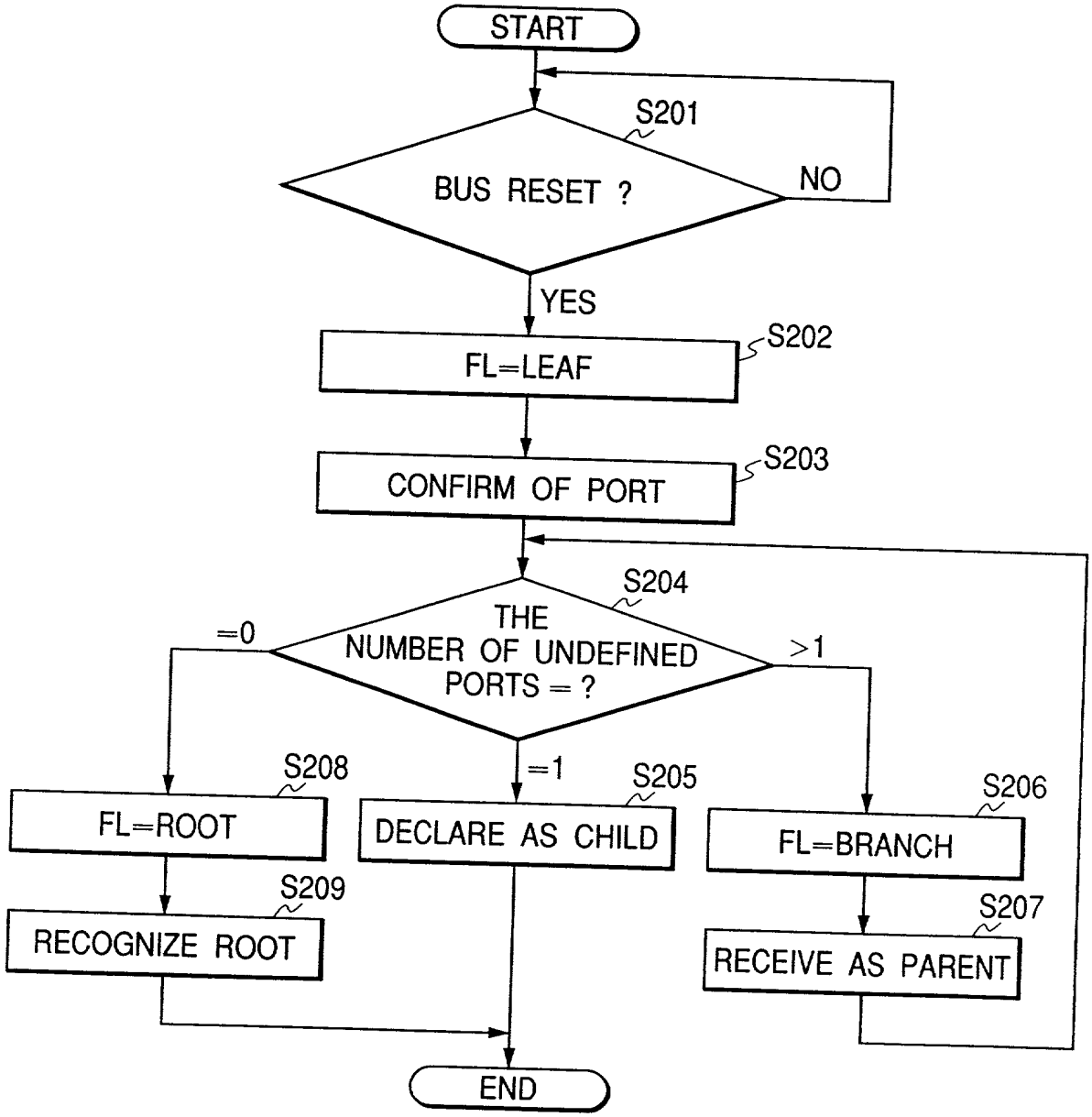

START
S201
BUS RESET ?
NO
YES
S202
FL=LEAF
S203
CONFIRM OF PORT
S204
THE NUMBER OF UNDEFINED PORTS = ?
=0
=1
>1
S208
FL=ROOT
S209
RECOGNIZE ROOT
S205
DECLARE AS CHILD
S206
FL=BRANCH
S207
RECEIVE AS PARENT
END

FIG. 21

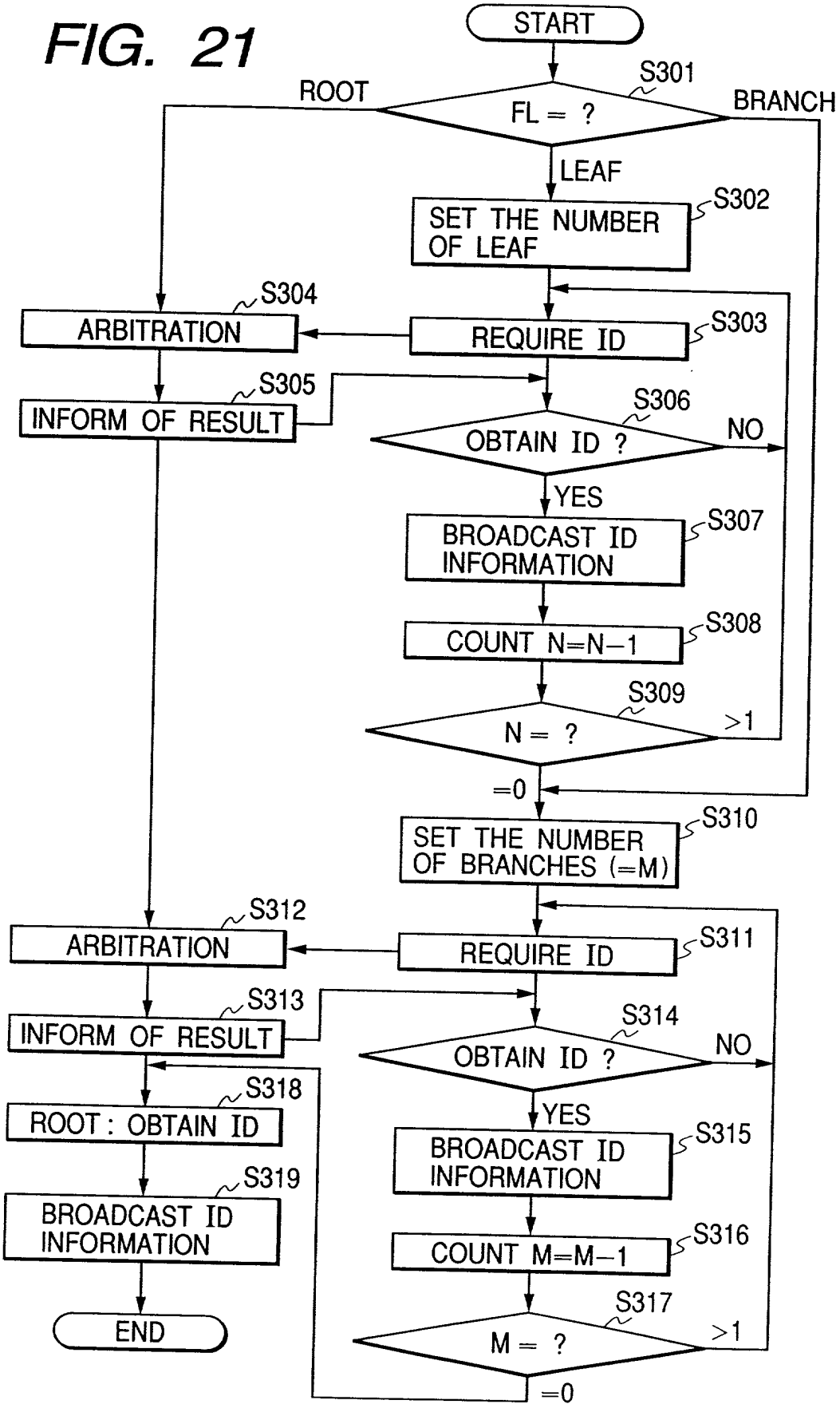

START
S301
FL = ?
ROOT
BRANCH
LEAF
SET THE NUMBER OF LEAF
S302
S304
ARBITRATION
REQUIRE ID
S303
S305
INFORM OF RESULT
S306
OBTAIN ID ?
NO
YES
BROADCAST ID INFORMATION
S307
COUNT N=N−1
S308
S309
N = ?
>1
=0
SET THE NUMBER OF BRANCHES (=M)
S310
S312
ARBITRATION
REQUIRE ID
S311
S313
INFORM OF RESULT
S314
OBTAIN ID ?
NO
S318
ROOT : OBTAIN ID
YES
BROADCAST ID INFORMATION
S315
S319
BROADCAST ID INFORMATION
COUNT M=M−1
S316
S317
M = ?
>1
END
=0

FIG. 22

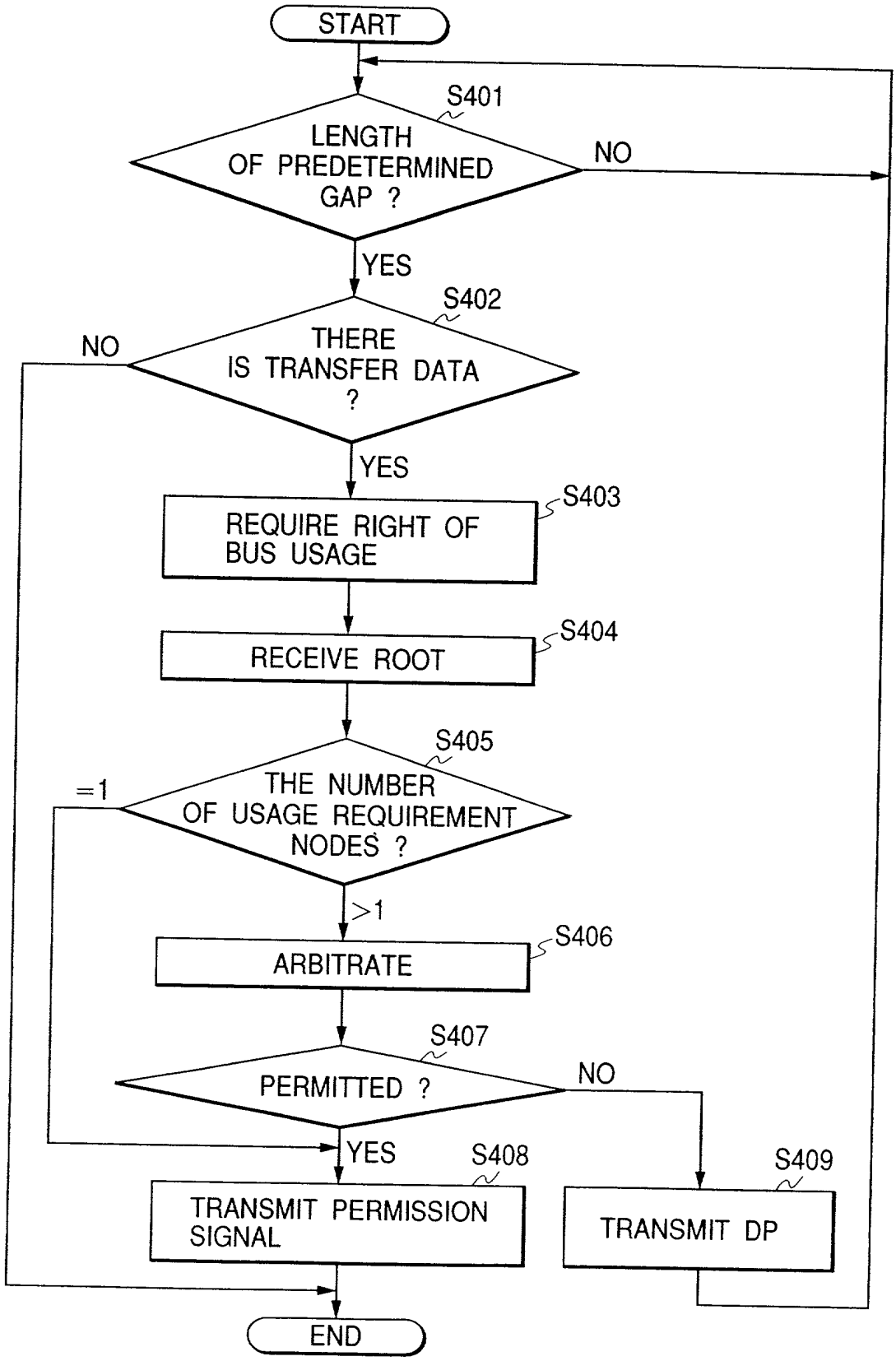

START
S401
LENGTH OF PREDETERMINED GAP ?
NO
YES
S402
THERE IS TRANSFER DATA ?
NO
YES
S403
REQUIRE RIGHT OF BUS USAGE
S404
RECEIVE ROOT
S405
THE NUMBER OF USAGE REQUIREMENT NODES ?
=1
>1
S406
ARBITRATE
S407
PERMITTED ?
NO
YES
S408
TRANSMIT PERMISSION SIGNAL
S409
TRANSMIT DP
END

FIG. 23

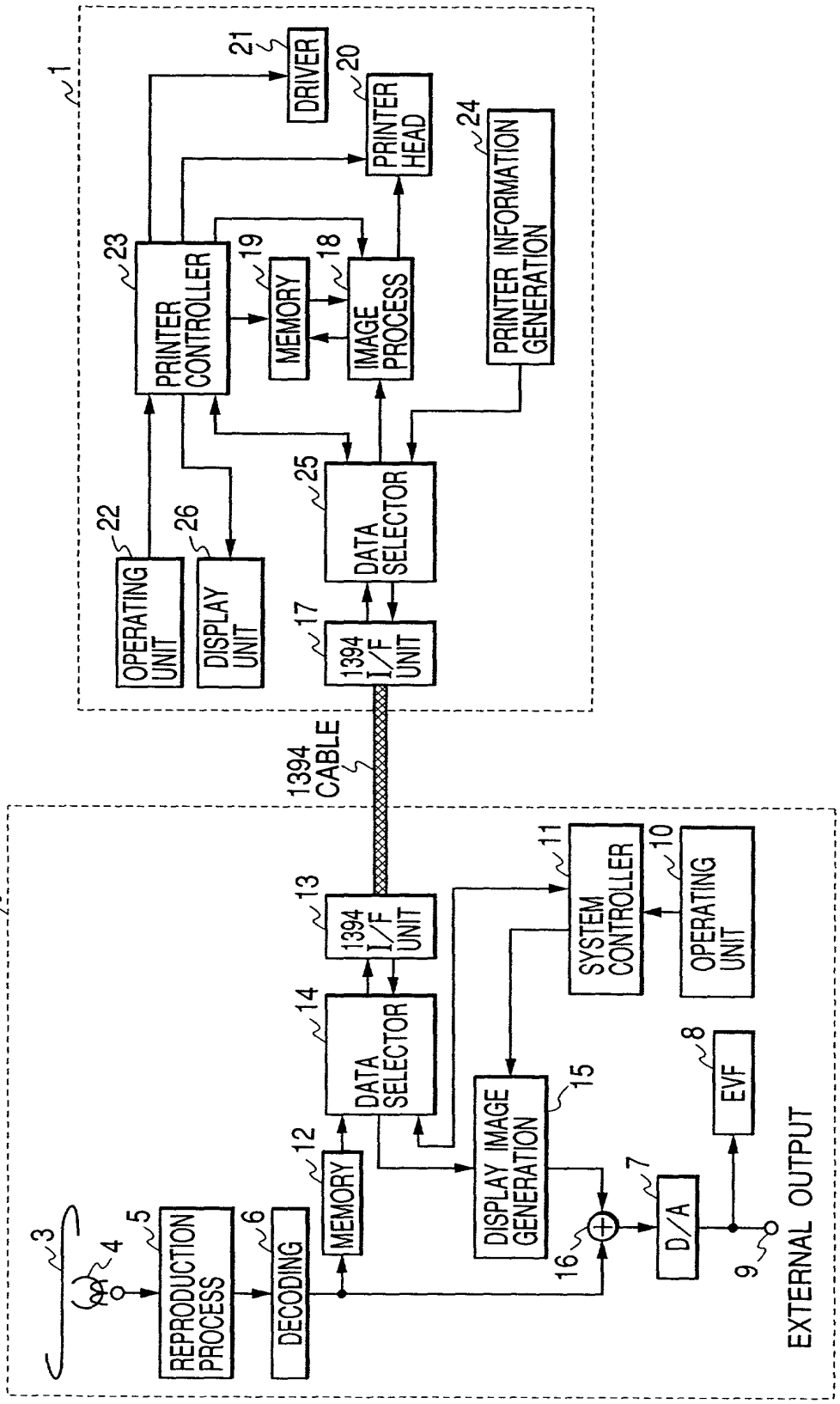

1
21
DRIVER
20
PRINTER HEAD
24
PRINTER INFORMATION GENERATION
23
PRINTER CONTROLLER
19
MEMORY
18
IMAGE PROCESS
22
OPERATING UNIT
26
DISPLAY UNIT
25
DATA SELECTOR
17
1394 I/F UNIT
1394 CABLE
102
13
1394 I/F UNIT
11
SYSTEM CONTROLLER
10
OPERATING UNIT
14
DATA SELECTOR
15
DISPLAY IMAGE GENERATION
8
EVF
12
MEMORY
7
D/A
16
9
3
4
5
REPRODUCTION PROCESS
6
DECODING
EXTERNAL OUTPUT

FIG. 24A

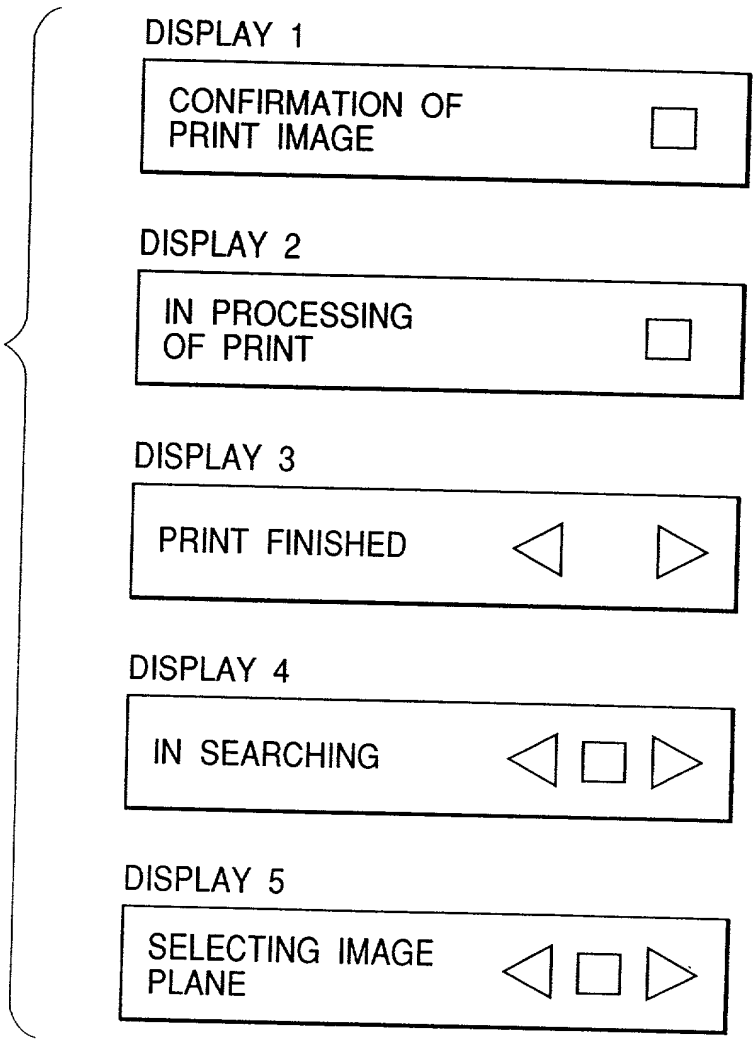
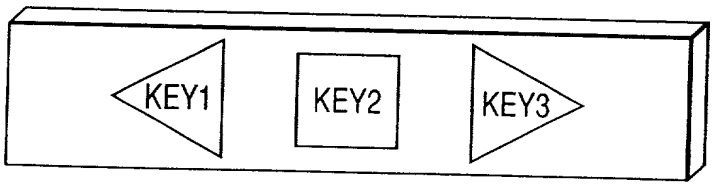


FIG. 24B



EPSON 3D3G

FIG. 25

FIG. 25A	FIG. 25B

FIG. 25A

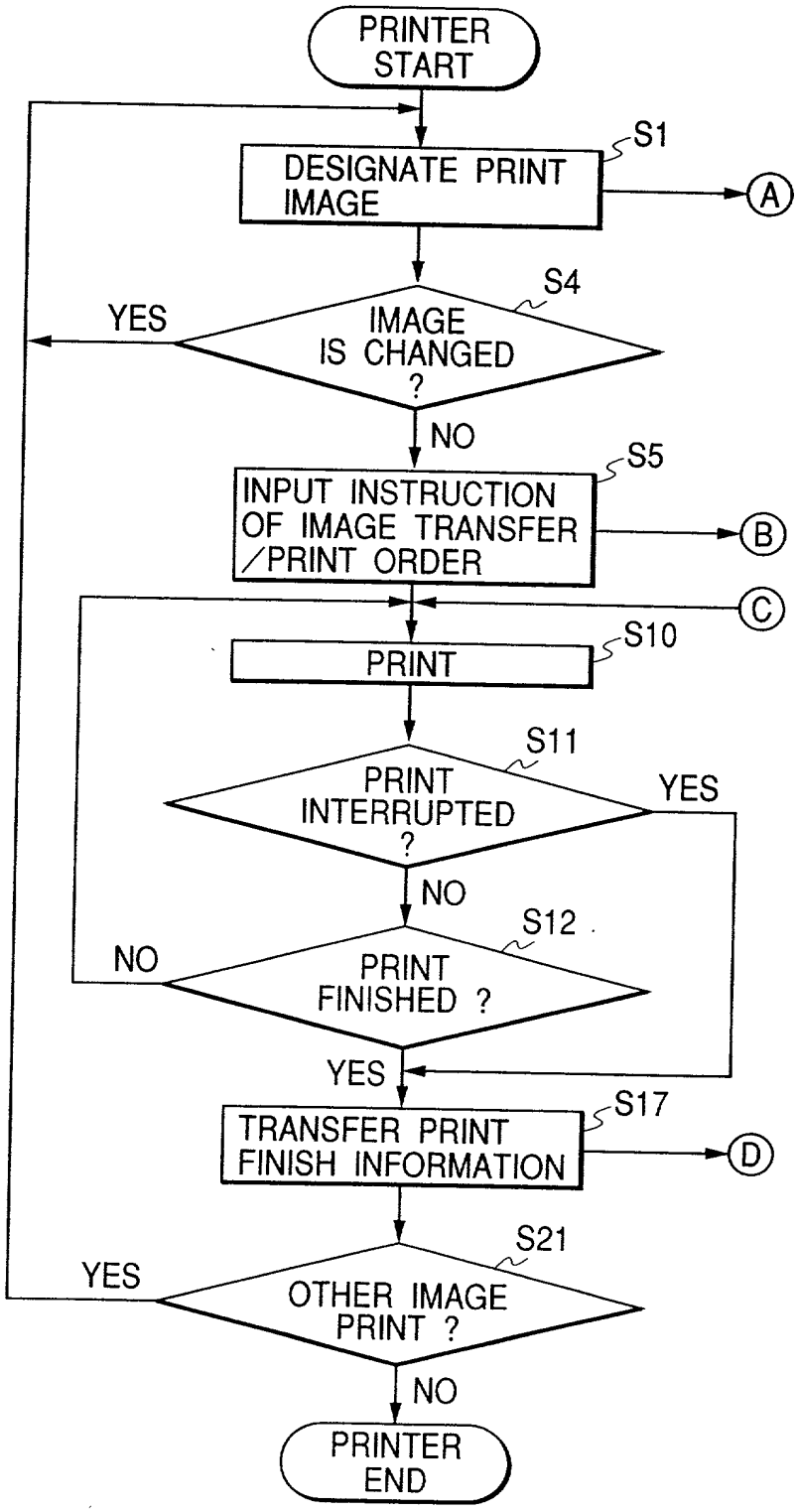


FIG. 25B

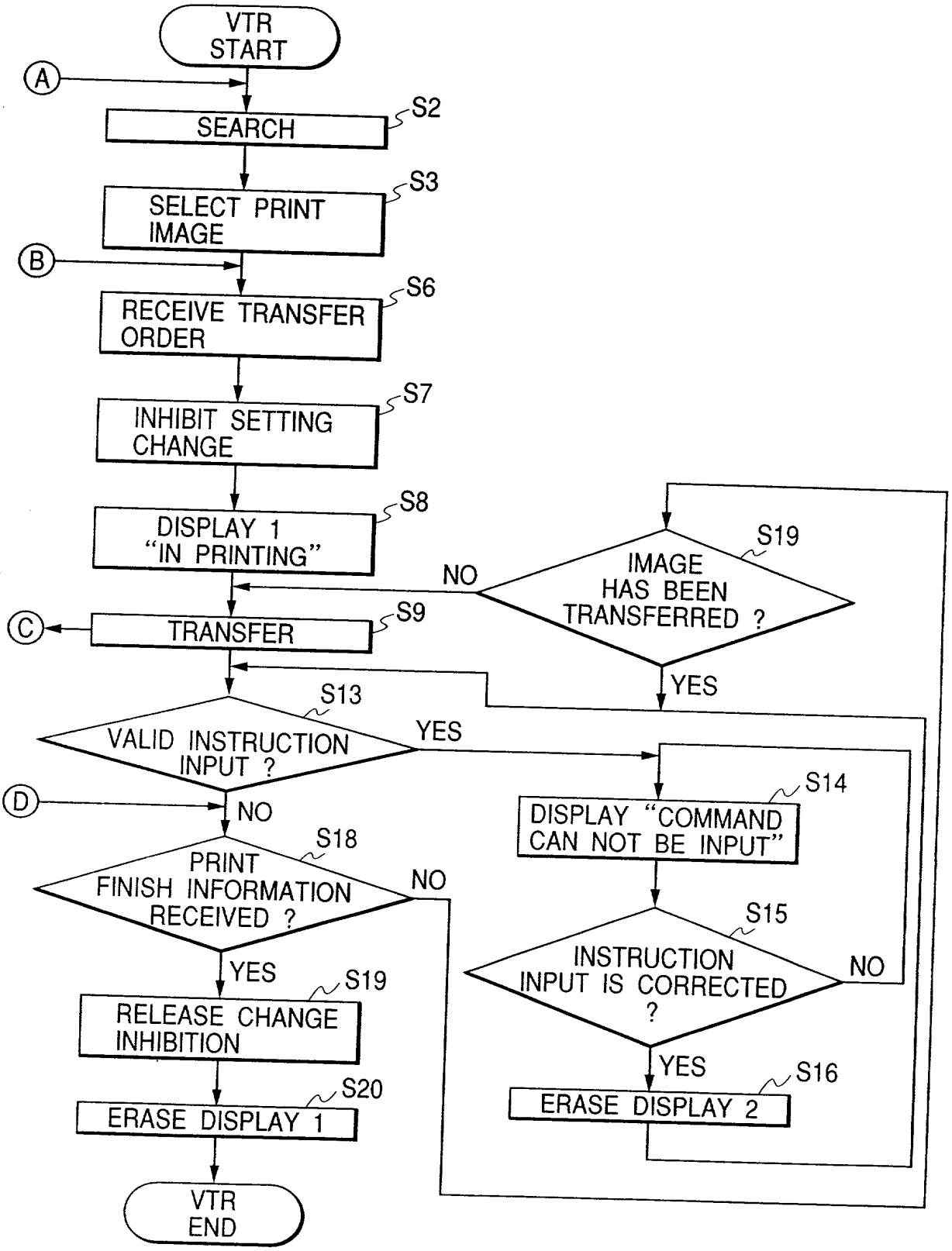

VTR START
A
SEARCH
S2
SELECT PRINT IMAGE
S3
B
RECEIVE TRANSFER ORDER
S6
INHIBIT SETTING CHANGE
S7
DISPLAY 1 "IN PRINTING"
S8
TRANSFER
S9
C
IMAGE HAS BEEN TRANSFERRED ?
S19
NO
YES
VALID INSTRUCTION INPUT ?
S13
YES
D
NO
DISPLAY "COMMAND CAN NOT BE INPUT"
S14
INSTRUCTION INPUT IS CORRECTED ?
S15
NO
YES
ERASE DISPLAY 2
S16
PRINT FINISH INFORMATION RECEIVED ?
S18
NO
YES
RELEASE CHANGE INHIBITION
S19
ERASE DISPLAY 1
S20
VTR END

FIG. 26

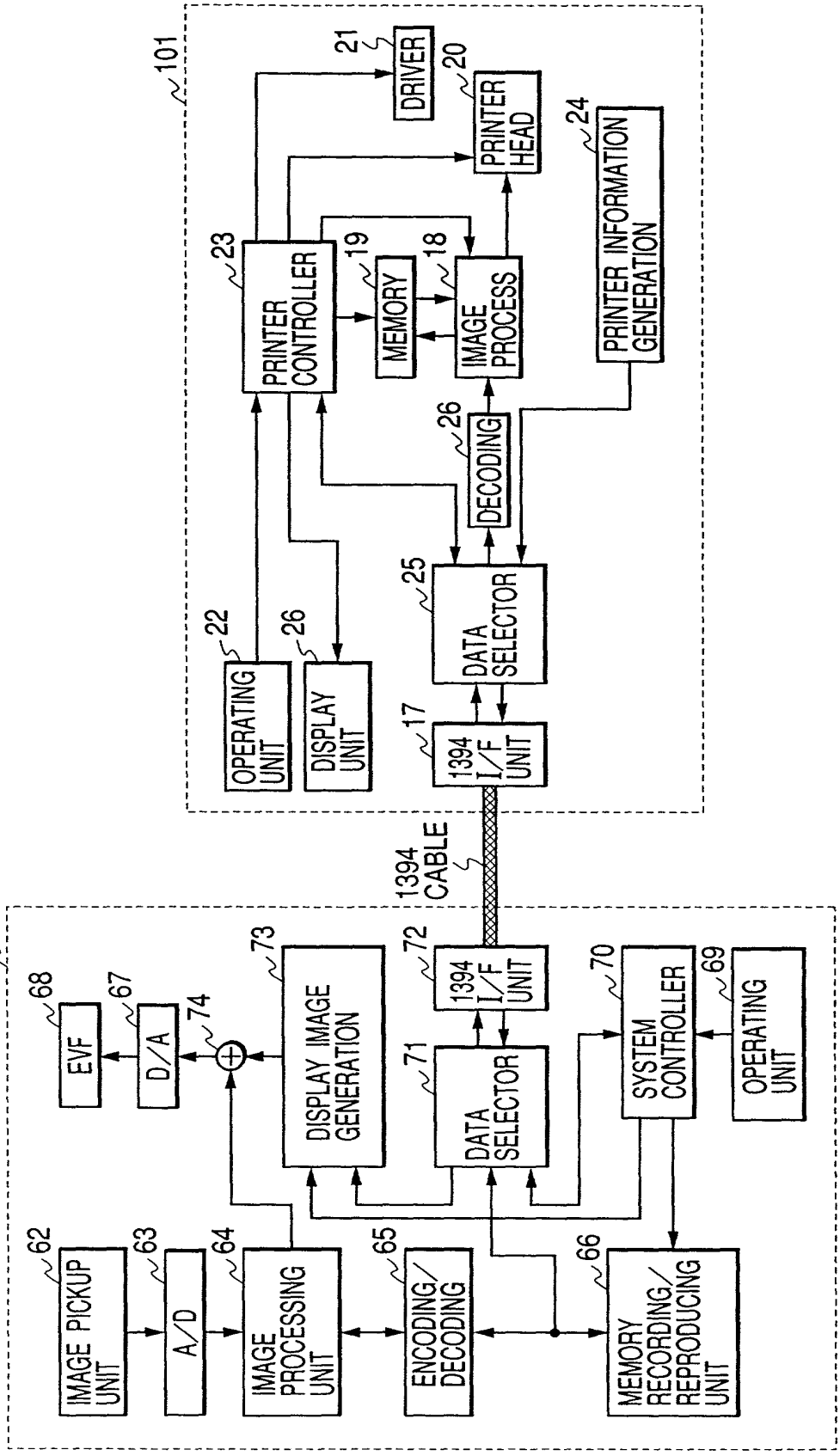

101
21
DRIVER
20
PRINTER HEAD
24
PRINTER INFORMATION GENERATION
23
PRINTER CONTROLLER
19
MEMORY
18
IMAGE PROCESS
26
DECODING
22
OPERATING UNIT
26
DISPLAY UNIT
25
DATA SELECTOR
17
1394 I/F UNIT
1394 CABLE
105
68
EVF
67
D/A
74
73
DISPLAY IMAGE GENERATION
72
1394 I/F UNIT
70
SYSTEM CONTROLLER
69
OPERATING UNIT
71
DATA SELECTOR
62
IMAGE PICKUP UNIT
63
A/D
64
IMAGE PROCESSING UNIT
65
ENCODING/ DECODING
66
MEMORY RECORDING/ REPRODUCING UNIT

FIG. 27

FIG. 27A	FIG. 27B

FIG. 27A

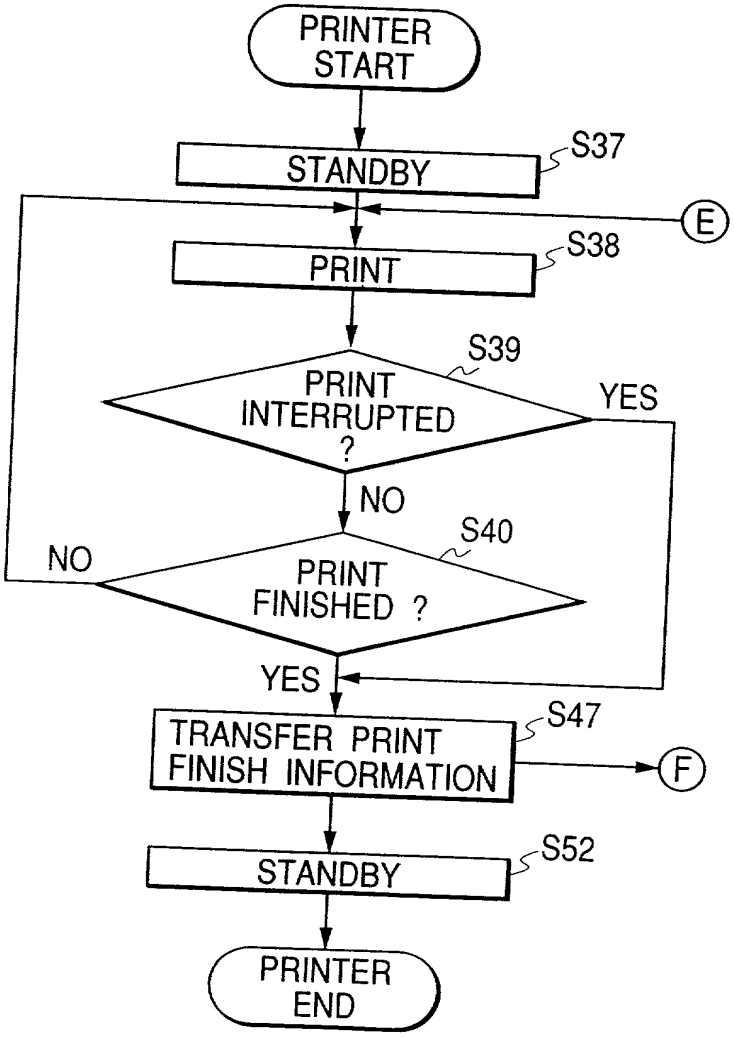
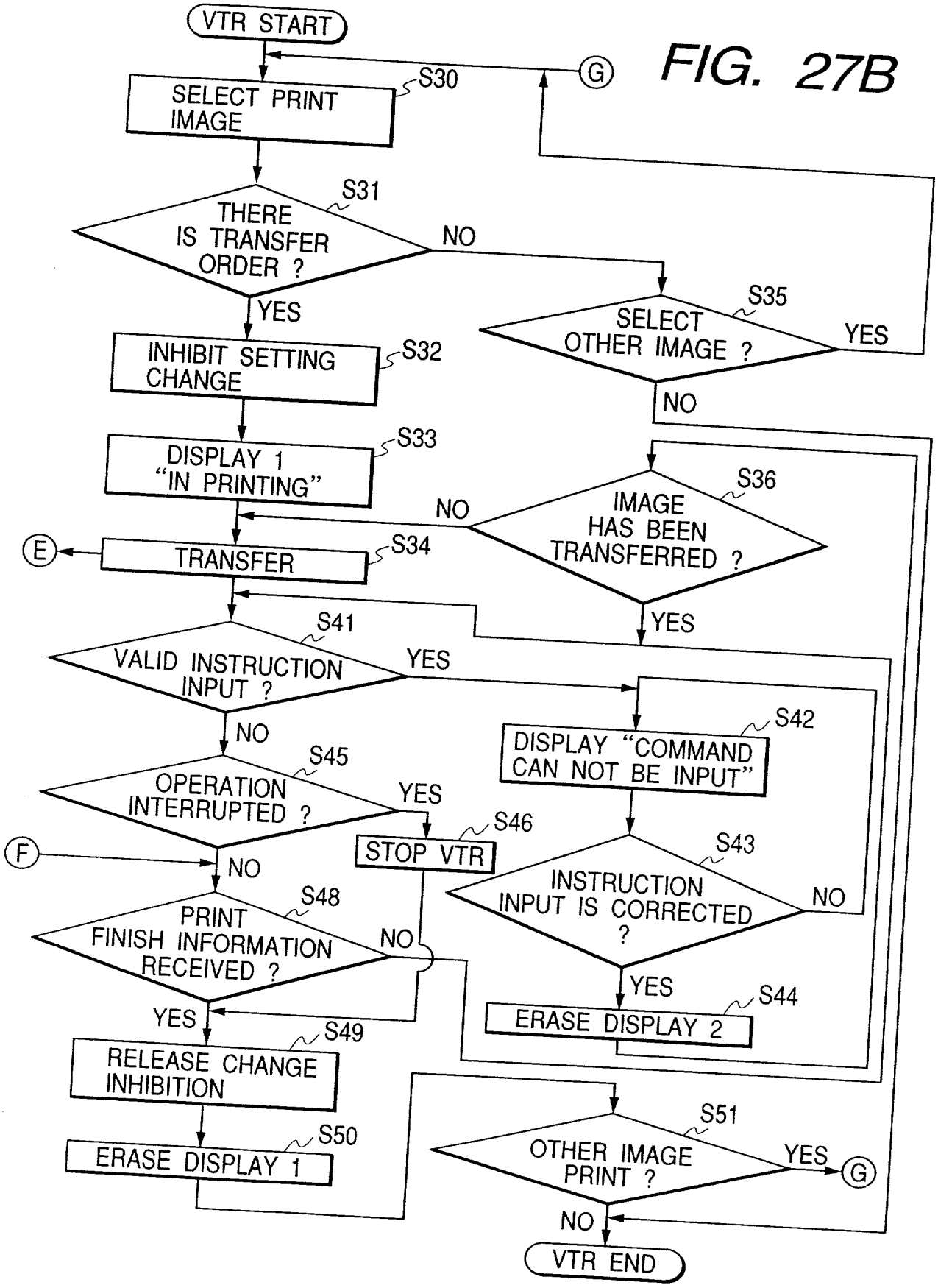


FIG. 27B


VTR START
SELECT PRINT IMAGE
S30
G
THERE IS TRANSFER ORDER ?
S31
NO
YES
INHIBIT SETTING CHANGE
S32
DISPLAY 1 "IN PRINTING"
S33
TRANSFER
S34
E
SELECT OTHER IMAGE ?
S35
YES
NO
IMAGE HAS BEEN TRANSFERRED ?
S36
NO
YES
VALID INSTRUCTION INPUT ?
S41
YES
NO
DISPLAY "COMMAND CAN NOT BE INPUT"
S42
OPERATION INTERRUPTED ?
S45
YES
STOP VTR
S46
F
NO
INSTRUCTION INPUT IS CORRECTED ?
S43
NO
YES
PRINT FINISH INFORMATION RECEIVED ?
S48
NO
YES
ERASE DISPLAY 2
S44
RELEASE CHANGE INHIBITION
S49
ERASE DISPLAY 1
S50
OTHER IMAGE PRINT ?
S51
YES
G
NO
VTR END